COMUNICAÇÃO CIENTÍFICA (SHORT COMMUNICATION)

Record of *Achatina fulica* Bowdich (Mollusca, Gastropoda) in the Cerrado-Caatinga ecotone in southern Piauí State, Brazil

Registro de *Achatina fulica* Bowdich (Mollusca, Gastropoda) no ecótono Cerrado-Caatinga, no sul do Estado do Piauí, Brasil

CLÁUDIA RENATA MADELLA[1]
& PAULO AURICCHIO[2]

Originally from the east and northeast Africa, *Achatina fulica* BOWDICH, 1822, (Achatinidae) known as giant African snail, was introduced in Brazil in 1988. The aim of its introduction was to increase the heliciculture, which is the gastropod farming of the genus *Helix* to human consumption (KOSLOKI & FISCHER 2002, TELES & FONTES 2002). However, the introduction of these snails had not a environmental authorities' previous authorization nor any plan and adequate technical training. Additionally Brazilian people did not accept this mollusc for food and consequently the farmers abandoned thousands of specimens in the nature, resulting in environmental problems in the subsequent years (MAPA 2003).

Nowadays, *A. fulica* is found in almost all Brazilian regions, mainly throughout the coast and in central-east. Its distribution is getting wider year after year, mainly between neighboring municipalities, due to their accidental transport in plants and other products with which it is associated (THIENGO *et al.* 2007).

[1] Rua Rui Lima, 2751, Acarape, CEP 64002-090, Teresina, PI, Brasil. E-mail: clauremade@gmail.com. [2] Author for correspondence. Universidade Federal do Piauí, Centro de Ciências da Natureza, Departamento de Biologia — Campus Ministro Petrônio Portela, Bairro Ininga, CEP 64049-550, Teresina, PI, Brasil. E-mail: paulo.auricchio@ufpi.edu.br.

Due to its high resistance to environmental changes and high breading capacity (Fischer & Colley 2005), this mollusc is easily found in urban areas, living in small domestic plantations and in ornamental plants of house gardens, but also can be found in forests and commercial plantations (Fischer *et al.* 2006). Furthermore, this snail was recorded in some Brazilian Conservation Units, as Reserva Biológica de Poço das Antas (Rio de Janeiro), Parque Nacional Chapada dos Guimarães (Mato Grosso) and Parque Nacional Saint-Hilaire/Lange, Guaratuba, Paraná (Fischer & Colley 2004, Thiengo *et al.* 2007).

In this context, *A. fulica* became one of the most important urban and agricultural pest, that promote environmental imbalance due competition with native species (Leão *et al.* 2011). Besides this, it is a threat to public health as it is an intermediate host of *Angiostrongylus* nematodes, which causes angiostrongyliasis. Until now, twenty species of worms had been found in *Achatina* making rodents, cattle, horses, ovines, monkeys, dogs, cats and urban rats as their definitive hosts. Among these twenty species, two must be emphasized because of its sanitary and epidemiologic importance: *Angiostrongylus cantonensis* Chen, 1935 and *Angiostrongylus costaricensis* Morera & Céspedes, 1971, which can take humans as hosts (Levine 1980). In an epidemiologic context, the meningo-encephalic angiostrongyliasis caused by *A. cantonensis* still remains absent in the American continent, but another disease caused by *A. costaricensis* is found from the United States to north Argentina, and it is characterized by abdominal disorders (Morera, 1988).

Attempting to the damage that *A. fulica* can do to agriculture, to public health and to the environment, this work aims to report the occurrence of *A. fulica* in the southern Piauí State, Brazil and discuss the possible consequences it can cause for the region, an ecotone between Cerrado and Caatinga. This find enlarges the geographic distribution of *A. fulica* in Brazil.

Dozens of specimens of *A. fulica* was found in one store of ornamental plants, municipality of Bom Jesus (09º04'28" S, 44º21'31" W, altitude 277 meters), southern Piauí State, Brazil, in February 2012, by the junior author of this study. Fifteen specimens were collected in that commercial store and were sent to the Zoology Laboratory of the Federal University of Piauí, campus Cinobelina Elvas, in the same city. Dried shells of the molluscs were measured and preserved as reference. They measured from 30 to 53 millimeters in length.

As stated by the owner of the store, the molluscs came from São Paulo, southeast Brazil in a batch plant. Seeming not to care about the presence of molluscs and unaware that it was an invasive species, the

owner of the store was instructed by us to fight the animals through incineration and that should only handle them with his hands protected. However, so far we do not know whether the information provided aroused concern and awareness and if he conducted the indicated procedures.

The presence of Giant African Snail in the store is a problem for the follow reasons:

1) Until now *A. fulica* was not observed in urban area in Bom Jesus town, but it is possible that it reaches there by ornamental plants sold by the store;

2) An infestation by *A. fulica* in urban areas may be problematic and may result in cases of angiostrongyliasis in the human population;

3) The species is a threat to local agriculture because they feed on vegetables;

4) It is competitive with native species and a threat to biodiversity in Conservation Units of southern Piauí.

Bom Jesus has approximately 23.000 inhabitants (IBGE 2010) and it is a region of ecotone Caatinga-Cerrado. With respect to public health, the city of Bom Jesus lacks sewerage system and waste treatment. The lack of these resources is already a problem, and the possibility of *A. fulica* spread in the wild is emminent. Besides *A. fulica*, molluscs as *Phyllocaulis variegatus* Semper, 1885, *Limax maximus* Linnaeus, 1758, *L. flavus* Linnaeus, 1758, *Bradybaena similaris* Ferrussac, 1821, *Subulina octona* Bruguière, 1789, *Veronicella* slugs, the Prosobranchia *Deroceras* and the freshwater *Pomacea canaliculata* Lamarck, 1822, are species that can be found in almost all environments and may also participate as intermediate hosts of *A. cantonensis*. Otherwise, some studies showed that infection and the production of the nematode larvae are higher in *A. fulica* compared to other molluscs (Wallace & Rosen 1969, Malek & Cheng 1974, Nishimura & Sato 1986).

The larvae of these nematodes live in the epidermis mucus produced by the molluscs, and because they are herbivores, they may contaminate plant species grown for human consumption (Teles, *et al.* 1997). Considering this fact and that most of the population of Bom Jesus has orchards and/or home gardens, if *A. fulica* spreads through the city is possible that human consumption of these vegetables can lead to infection by this parasite.

Although angiostrongyliasis rarely leads to death, clinical symptoms vary and may manifest over several months and, in some cases, permanent eye damage may occur (Wilson, 1991). Additionally, according to Teixeira *et al.* (1987), abdominal angiostrongyliasis is underdiagnosed and, in consequence, underreported.

Concerning to agriculture, *A. fulica* has been responsible for devastating banana, papaya, peanuts, coffee, citrus and others, as well as the destruction of stored grains, gardens and home gardens (Godan 1983) in other regions. Invasive alien species are already known to cause major economic damage worldwide (Raut & Barker 2002, Gisp, 2005), and annual losses in agriculture are estimated at up to 248 billion dollars (Bright, 1999), with 120 billion only in the USA (Pimentel *et al.,* 2005). Considering these data about the damages that *A. fulica* may cause to large-scale plantations, several plantations could be affected in southern Piaui, if the farmers are not aware.

Thus, the occurrence of specimens of *A. fulica* at this ornamental plant store in Bom Jesus, is dangerous as a disseminating mechanism of this plague. The habits of the local population, including farming, making small vegetable and flower gardens at their homes, coupled with the ignorance of the population about the danger that this snail species can bring, this mollusc can spread very quickly in the region, reaching the large scale plantations located a few kilometers away from the city. Perhaps more serious than this, other damages that *A. fulica* may take place in southern Piauí, is its establishment in Conservation Areas.

Situated in an ecotonal area between Cerrado and Caatinga, Piaui has 39 Units Conservation (UCs), ranging from two to thousands of acres. However, although the numbers give an impression of biodiversity protection, these UCs represent only 10% of the entire state area, the minimum stipulated by the International Union for Conservation of Nature (IUCN). Moreover, there is no uniformity in the management plans of these UCs, ranging from those that are well protected by those who are completely abandoned (Mendes, 2008).

Environment invasion by exotic species is considered the leading cause of biodiversity loss in protected areas (Millennium Ecosystem Assessment 2005, Gisp 2005, Ziller & Zalba 2007) and the threat to biodiversity has been a major problem in the world today and the situation in the tropics is more evident (Wilson 1997, WWF 2008). Other records of *A. fulica* in Brazilian Conservation Units have been detected and the impact and consequences of their presence have never been studied and are difficult to assess.

Resolution number 05/2009 of the National Biodiversity Commission (CONABIO) recognizes and emphasizes the need for action to eradicate, control and monitoring invasive alien species in protected areas (Leão *et al.* 2011). In this regard, in January 2003, IBAMA issued a Technical Opinion (DPC / PSC / IVD - n °: 003/03) on the control and eradication of the giant African snail, which mentions that the introduction of this animal was illegal in Brazil and has disrespected the Ordinance No. 102/

98 of 15 July 1998 of IBAMA and still declares the ban of its import by the Department of Animal Health, farming and trade (MAPA 2003).

Among all the problems presented here, it can be concluded that eradication and control measures should be implemented as soon as possible in the municipality of Bom Jesus, Piauí, in order to prevent the Giant African Snail spreads throughout the region. We emphasize that campaigns against *A. fulica* should be planned carefully, as campaigns in other parts of the country have threatened other species of molluscs, such as those belonging to the native genera *Megalobulimus* and *Thaumastus*, with major attention to *Megalobulimus oblongus*, because of its similarity in size with *A. fulica*. In order to make suitable control and / or eradication of *A. fulica*, more studies and constant environmental monitoring should be conducted, as well as local educational campaigns to the population. Moreover, control of snails and their eggs must be done manually with hands protected and after, the snails must be incinerated. It is noteworthy that there is no specific molluscicidal and several strategies using chemicals have been created without success (Panigrahi *et al.* 1993, Simião & Fischer 2004).

SUMÁRIO

Introduzido no Brasil em 1988 com o objetivo de incrementar a produção de *escargots* no Brasil, o caramujo gigante africano, *Achatina fulica* Bowdich, 1822, tornou-se uma praga urbana, agrícola e uma ameaça para o meio ambiente e a saúde pública em pouco mais de duas décadas. Sem planejamento e autorização do órgão ambiental competente, os produtores de *A. fulica* não tiveram sucesso em sua comercialização e abandonaram estes animais no ambiente, resultando em uma ampla disseminação por quase todo o território nacional. Portador de nematódeos parasitas do Gênero *Angiostrongylus* compromete a saúde pública e, na agricultura, já provocou grandes perdas econômicas através da destruição de plantações. No meio ambiente, sua presença constitui um dos problemas mais graves, pois já foi registrada em Unidades de Conservação, o que resulta em uma ameaça à biodiversidade, fato de difícil avaliação. Neste trabalho foram coletados exemplares de *A. fulica* em um estabelecimento comercial de plantas ornamentais, localizado na cidade de Bom Jesus, sul do Estado do Piauí, Brasil. A distribuição geográfica para *A. fulica* é aqui ampliada e chama atenção para os possíveis problemas que este gastrópode pode causar na região, caso não sejam realizadas medidas de controle e/ou erradicação.

Palavras-chave: caramujo gigante africano; invasão; Piauí; Caatinga; Cerrado

SUMMARY

Giant African Snail, *Achatina fulica* Bowdich, 1822 was introduced in Brazil in 1988 in an attempt to increase the production of edible molluscs as *escargots*. However, as in other countries, this mollusc became an urban and agricultural plague and a threat to the environment and public health, in little more than two decades. Without planning and official authorization, the producers of *A. fulica* had no success in commercializing it and they abandoned the animals, resulting in a wide spread in almost all national territory. Intermediate host of nematodes of *Angiostrongylus*, *A. fulica* is a threat to the public health and for the agriculture it can cause large economic losses by crop destruction. Additionally its presence has been already recorded in conservation areas, which results in threats to biodiversity, which is difficult to evaluate. Several individuals of *A. fulica* were collected in an ornamental plant store in the municipality of Bom Jesus, southern Piauí State, Brazil. The geographic distribution of *A. fulica* is here extended and we call attention to some possible problems this gastropod may cause in the area if a serious control and/or eradication plan is not conducted.

Key words: caatinga, cerrado, giant African snail, alien apecies, Piauí.

BIBLIOGRAFIA

Bright, C. 1999. *Invasive species: pathogens of globalization.* Foreign Policy Fall, v. 1999, p. 50-64.

Fischer, M. L. & E. Colley. 2004. Diagnóstico da ocorrência do caramujo gigante africano *Achatina fulica* Bowdich, 1822 na APA de Guaraqueçaba, Paraná, Brasil. *Revista Estudos Biol. 26*: 43-50.

Fischer, M. L. & E. Colley. 2005. Espécie invasora em reservas naturais: caracterização da população de *Achatina fulica* Bowdich, 1822 (Mollusca – Achatinidae) na Ilha Rasa, Guaraqueçaba, Paraná, Brasil. *Biota Neotropica 5* (1): 1-18.

Fischer, M.; L. M. Simião; E. Colley; R.D. Zenni; D.A.T. Silva & N. Latoski. 2006. O caramujo exótico invasor na vegetação nativa de morretes, PR: diagnóstico da população de *Achatina fulica* Bowdich, 1822 em um fragmento de Floresta Ombrófila Densa aluvial. *Biota Neotropica 6* (2).

Gisp. 2005. Programa global de espécies invasoras. *América do Sul invadida. A crescente ameaça das espécies exóticas invasoras*. 80 pp.

Godan, D. 1983. *Pests slugs and snails*. Berlin, Springer-Verlag.

IBGE — Instituto Brasileiro de Geografia e Estatística. <http://www.ibge.gov.br/cidadesat/topwindow.htm> [Accessed: 01/15/2013]

Kosloki, M.A. & M.L. Fischer. 2002. Primeira ocorrência de *Achatina fulica* (Bowdich, 1822) no litoral do Estado do Paraná (Mollusca; Stylommatophora; Achatinidae). *Est. Biol. 24*: 65-69.

Leão, T. C. C.; W. R. Almeida; M. S. Dechoum & S. R. Ziller. 2011. *Espécies exóticas invasoras no nordeste do Brasil: contextualização, manejo e políticas públicas.* Recife: CEPAN.

Levine, N. D. 1988. Nematode parasite of domestic animals and man. Burgess Publishing Co., Second Edition.

Malek, E. A. & T. C. Cheng. 1974. *Medical and economic malacology*. New York, Academic Press.

MAPA – Ministério da Agricultura, Pecuária e Abastecimento. 2003. Parecer técnico DPC/CPP/DDIV - n° 003/03 — Assunto: Controle e erradicação do molusco exótico *Achatina fulica* Processo n° 21.000.001595/2002-61.

Mendes, M. M. S. 2008. Categorias e distribuição das unidades de conservação do estado do Piauí. *Diversa* Ano I (2): 35-53.

Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being: biodiversity synthesis. Washington, DC.

Morera, P. 1988. Angiostrongilíase abdominal. Um problema de saúde pública? *Rev. Soc. Bras. Med. Trop. 21*: 81-3.

Nishimura, K. & Y. Sato. 1986. Natural infection with *Angiostrongylus cantonensis* in *Ampullarius canaliculatus* (Lamarck) in the Ryukyu island, Japan. *J. J. Parasitol. 35:* 469-70.

Panigrahi, A. & Raut, K. 1993. On the safe use pesticides in controlling the terrestrial mollusc pest. *Memórias do Instituto Oswaldo Cruz 88* (2): 293-98.

Pimentel, D.; R.Zuniga; D. Morrison. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecological Economics* 52.

Raut, K. & G. Barker. 2002. *Achatina fulica Bowdich and other Achatinidae pest in tropical agriculture*. Molluscs as Croop Pest, pp. 55-144.

Simião, M. S. & M. L. Fischer. 2004. Estimativa e inferências do método de controle do molusco exótico *Achatina fulica* Bowdich, 1822 (Stilommatophora; Achatinidae) em Pontal do Paraná, litoral do Estado do Paraná. *Cad. Biodivers. 4* (2).

Teixeira, C. G.; L. C. Coura & H. L. Lenzi. 1987. Abdominal angiostrongyliasis — an under-diagnosed disease. *Mem. Inst. Oswaldo Cruz 82* (supl. IV): 353-4.

Teles, H. M. S.; J. F. Vaz; L. R. Fontes & M. F. Domingos. 1997. Registro de *Achatina fulica* Bowdich, 1822 (Mollusca, Gastropoda) no Brasil: caramujo hospedeiro intermediário da angiostrongilíase. *Revta Saúde Pública 31* (3): 310-12.

Teles, H. M. S. & L. R. Fontes. 2002. Implicações da introdução e dispersão de *Achatina fulica* Bowdich, 1822 no Brasil. *Boletim do Instituto Adolfo Lutz 12* (1): 3-5.

Thiengo, S. C.; F. A. Faraco; N. C. Salgado; R. H. Cowie & M. A. Fernandez. 2007. Rapid spread of an invasive snail in South America: the giant African snail, *Achatina fulica*, in Brasil. *Biol. Invasions* 9: 693-702.

Wallace, G. D. & L. Rosen. 1969. Studies on eosinophilic meningities. V. molluscan hosts and *Angiostrongylus cantonensis* on the Pacific Islands. *Am. J. Trop. Med. Hyg*. *18*: 206-16.

Wilson, M.E. 1991. *A world guide to infections: diseases, distribution, diagnosis*. New York, Oxford University Press.

Wilson, E. O. 1997. *A situação atual da diversidade biológica*. *In:* E. O. Wilson (Ed.) Biodiversidade. Nova Fronteira, Rio de Janeiro.

WWF. ZSL, GFN. 2008. Living planet report.

Ziller, S. R. & S. Zalba. 2007. Propostas de ação para prevenção e controle de espécies exóticas invasoras. *Natureza e Conservação* 5 (2).

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